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SHIP ACTIVITY RELATED DATA AND INFORMATION IN THE AGE OF BUSINESS PLANNING AND PERFORMANCE MEASUREMENT

By
LCdr P.L. Massel
And
Mr Jay Adamsson

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By

LCdr P.L. Massel
and
Mr Jay Adamsson

Recommended by:
D.W. Mason,
Team Leader CORT./MORT

Approved by:
J.G. Moscrip,
DOR(CAM)

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ABSTRACT

This research note presents a review of the current sources of unit level, activity-related, data and information followed by an assessment of the Information Technology Architecture which is currently in place in the Canadian Forces' Maritime Command to support the capturing, transportation and transformation of activity-related data and information. It finds that this Information Technology Architecture is unsuited for the Department of National Defence's projected, activity-based, performance measurement needs. To improve this situation this research note recommends that a systems analysis based Information Audit be conducted followed by the development and implementation of an activity-related database management system.

RÉSUMÉ

Le présent compt rendu traite des sources actuelles de données et d'informations sur les activités au niveau des unités. On y évalue en outre l'architecture de la technologie de l'information ultilisée actuellement par le Commandement maritime des Forces canadiennes pour saisir ces données, les transmettre et les traiter. On conclut que cette architecture ne suffira pas à combler les bosoins prévus du ministère de la Défense nationale relatifs à la mesure de la performance fondée sur les acitivités. Pour remédier à cette situation, on recommande de procéder à une analyse systémique de l'architecture de l'infomration, puis de mettre au point et d'implanter un système de gestion de base de données fondé sur les activités.

EXECUTIVE SUMMARY

1. As a business planning approach takes a greater hold on the planning and commitment of the navy's resources, more and more effort is being focussed on accounting for and measuring the results of these business plans. Since these plans are to a greater or lesser extent measured in terms of outputs or what was done they are necessarily activity based. However, obtaining and analysing unit level, activity-related information on fleet activity is not currently an easy task. Efforts to find and apply this sort of information to support the Canadian Maritime Forces 2015 Study FLEETSIM effort led one of the authors to review the current possible sources of this type of data and information.

2. A total of seven possible sources of data and information were known to the authors but no one source or combination of more than one of these sources proves to be a reliable and easily accessible source of activity-related data and information. Five of these sources: Flex Schedules, Officer of the Watch Notebooks, Ships' Logs, Post Deployment Reports, and Annual Historical Reports are text based and thus are difficult to access and utilise. The remaining two potential sources are in an electronic format but have other limiting characteristics. The first of these is the Formation's Operations Schedules which is currently produced in an Excel spreadsheet supported format. Although they are reasonably accurate, Operations Schedules are predictive vice historical and are not always reflective of what actually occurred. As well, the spreadsheet format has been designed to be a good visual or graphic presentation of the information. However, in order to use the information for trend analysis it needs to be transformed into a more database like representation, a prototype process of which exists in DGOR MORT but is still under development. The final possible source is the Monthly Ship Activity reports which currently are read into the MCOIN system and transformed into a database application for MARLANT units and alternatively retained in paper form by MARPAC units. The use of this as a possible source is further compromised by limitations in the activity coding key, an inconsistent application of these codes at the unit level, and an indifferent use of the data by the receiving authority to the point where, in the assessment of the authors, the reliability of the activity-related, coded data contained in these reports is not very high.

3. These observations lead the authors to consider the current state of the navy's activity-related, Information Technology Architecture. An organisation's Information Technology Architecture defines the policies which govern the arrangement and employment of its

Information Technology related tools, data and information. In other words, it details the arrangements of an organisation's structures, processes and tools which exist to support the organisation's information needs. This research note focussed on reviewing the navy's current IT processes and tools that are in use to support the capture, storage, transportation, and transformation of activity-related information. The authors' observed that: the IT processes of data storage, data transport, and data transformation are poor; and that the navy's IT tools including hardware and software inventories are fair but its IT data inventory tools are poor.

4. The current state of the navy's Information Technology Architecture points to a serious problem in terms of developing any activity-related measurement or assessment tool: that the data and information needed to support such a tool is not readily available. Implementing such a tool without solving the data availability issues would entail imposing further manually intensive reporting procedures on the unit level staffs thus notably increasing the impediments to the tool's successful acceptance.

5. This research note concludes with the recommendation to transition the current largely paper based capture and storage of activity-related data to a well designed database management system. This should be done using a systems analysis based approach and could be accomplished in two phases: Phase I would involve conducting an activity-related Information Audit which would benchmark the current state of the capture, storage, transportation, and transformation practices and needs of the navy's activity-related data. Phase II would proceed with the development and implementation of an activity-related, database management system which would rationalise and streamline the IT Architecture needed to support the navy's evolving activity-based, information needs.

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LIST OF TERMS & ABBREVIATIONS

CMS	Chief of the Maritime Staff
FMAS	Financial and Managerial Accounting System
IT	Information Technology – the hardware and software tools that support the capture, storage, transportation, and transformation of data and information
MARCOM	Commander of the Maritime Forces
MARLANT	Commander of the Maritime Forces Atlantic
MARPAC	Commander of the Maritime Forces Pacific
MCOIN II & III	Maritime Command Operational Information System phases Two and Three
OOW	Officer of the Watch
ORES	Operational Readiness and Effectiveness System
ORMS	Operational Readiness Measurement System
PRAS	Planning Reporting and Accountability Structure

ACTIVITY RELATED DATA AND INFORMATION IN THE AGE OF BUSINESS PLANNING AND PERFORMANCE MEASUREMENT

INTRODUCTION

1. Canada's Navy currently operates a fleet of 21 major capital war ships and a smaller fleet of minor war ships and auxiliary vessels. These units, collectively known as the fleet, conduct a wide range of force generation and employment activities in support of Canada's defence needs. These needs are broadly articulated by the Canadian Government's 1994 Defence White Paper and by the Department of National Defence's annually produced Defence Planning Guidance 98. At the Chief of the Maritime Staff's (CMS) level, further direction and policy is stated in the Maritime Commander's Planning Guidance and in the annual business plans of the command and its subordinate formations.

2. At the unit level, Canada's naval forces routinely take part in a variety of activities that in one form or another attempt to meet the objectives of these policy requirements. In between, the staffs and commanders at the fleet, formation and command levels translate and link these high-level policy objectives to the unit level activities. As business planning efforts evolve and as the department moves towards the use of activity based costing and accrual accounting, it is the authors' opinion that these three command levels will become more and more interested in tracking the activities of their unit level resources, the ships.

3. One need only look at the evolving requirements of ORMS, ORES, PRAS and FMAS to see that the department is moving towards greater efforts of understanding the attribution of costs to various activities. As business planning and performance measurement evolve it is anticipated that increasing demands will be placed on staffs and units to combine and retain information on costs and activities (inputs and outputs in the language of PRAS) in order to be able to answer questions such as:

   a. what would the cost and impact be of deploying a task group for 6 months, or

   b. what would the cost and impact be of increasing the readiness of two additional ships from Normal to High Readiness.

In fact, the author's maintain that accessibility to this activity-related information is essential to the present and future planning and performance measurement of fleet activity.

4. Recently, as part of Canadian Maritime Forces 2015 Study, one of the authors has gone to considerable effort to study the availability and employment of seagoing units over time so that this could be accurately modelled in the study's FLEETSIM simulation (Reference [1]). Based on these efforts, it is our observation that unit level, activity-related information is, in its present state, not easily captured electronically, lacks completeness and accuracy, and will present a serious impediment to any effort to report unit level ship related activity information to a higher authority. Or in other words, the navy's current activity-related Information Technology[1] (IT) Architecture is ill suited for the expanding demands that various performance measurement approaches are or soon will be placing upon the chief generators of this data and information, the fleet. In general terms, what is needed is to conduct a review of the activity related data and information sources; as much as possible articulate the present and future data and information needs of various levels of supervision; and then proceed with the development and implementation of an activity-related, database management system which would rationalise and streamline the navy's current activity-related IT Arhcitecture.

5. This research note presents a review of the sources of activity-related data and an analysis of the current IT Architecture of the navy's activity-related information. It concludes with a recommendation to review this architecture with a view to developing and implementing a database management system which would better serve the future needs of the fleet and the department's evolving performance measurement tools.

SOURCES AND ARCHITECTURE OF ACTIVITY-RELATED DATA

SOURCES OF ACTIVITY-RELATED DATA

6. To begin with the authors define activity-related data or information to be data or information that describes in some form what a ship is going to do, is doing, or did at a given point in time. The needs of the different command levels often requires that the same data be transformed in different ways to produce different but related types of information. In earlier

[1] In this paper, the authors use the term 'Information Technology' or IT to refer to both the hardware and software tools that support the capture, storage, transportation and transformation of data and information.

work in support of the Canadian Maritime Forces 2015 Study, one of the authors considered seven current sources of data or information (Reference [1]). Briefly, they are Fleet Operations Schedules, ships' flex schedules, OOW notebooks, ships' logs, monthly activity reports, ships' annual historical reports, and post deployment reports. Brief descriptions of the strengths and weaknesses of each of these potential sources follow. A detailed more comparison between two of them, the operations schedules and the monthly activity reports, is presented in Annex A.

Fleet Operations Schedules

7. Operations Schedules are a day-by-day schedule of planned ship activities which presents the activity in a timeline format on a monthly basis. The Operations Schedules are created at the formation level on each coast, and are subject to change at any time up to the day in question. In the past, Operations Schedules were text-based, and only very recently have been replaced, at the formation level, by an Excel spreadsheet supported format. Old Operations Schedules are retained in paper format indefinitely at NDHQ's Directorate of History dating back to their inception in May 1968 (Reference [2]).

8. Because the Operations Schedules are created on each coast in a centralised location, there is a high level of data consistency between the ships and the data from year to year. This eliminates much of the misinterpretation of each of the entries – a given entry will have the same meaning for all ships across the fleet. With the exception of unplanned events, the Operations Schedules give a fairly accurate picture of ship activities on a day-by-day basis.

9. Operations Schedules provide a record of the planned ship activities. However, they often do not reflect last minute changes to ship schedules such as search and rescue missions or short notice responses to OGD demands. On rare but important occasions, they may also misrepresent an activity. For example they may schedule a ship for an independent ship exercise (ISE) when the ship is actually conducting a covert OGD or sovereignty related patrol. Such was the case for HMCS OJIBWA when she was scheduled for an ISE from 5-12 Mar 1993. In actuality, she deployed for 7 days on 'Operation Ambush', a covert fishery patrol surveillance mission on George's Bank (Reference [3 & 4]). In addition, past Operations Schedules are in a non-electronic, text format. This makes it difficult to quantify and analyse activities without a laborious transcription and categorisation. The present shift to an Excel spreadsheet supported format, does allow for initial electronic recording of the activity. However, because this application was optimised for a visual representation and not based on a database structure, further efforts would be required to extract, transform, and analyse this data

(efforts which are already partially developed by one of the author's as a result of work that has been done is support of the Canadian Maritime Forces 2015 FLEETSIM Study (Reference [1]).)

Ships' Flex Schedule

10. The ships' flex schedule is a list of, inter- and intra-ship activities planned for each ship during the upcoming day at sea. These activities include the operational readiness mandated training required, as well as the general plan for the ship's activity on an hourly basis. In short, it is the ship's 'day planner' and is prepared internally at the ship or fleet level.

11. The flex schedule is a planning document, and is updated as changes occur. It is a fair reflection of what internal training activities the ship conducted in the course of a day from a micro activity[1] perspective. It would not be a good source of unplanned activities and would be a poor record of actual operations vice training periods. Thus, its accuracy and utility varies with the type of macro level activity the ship is involved with. As well, since the flex is concerned with internal ship activities, such as drills and exercises, it would only offer indirect information on the type of macro level activity that the ship is conducting. Finally, in their current form, flex schedules are not retained and, thus, are a poor historical source

Officer of the Watch (OOW) Notebooks

12. OOW notebooks are created by the Officer of the Watch on the bridge of the ship. They are a text-based, chronological summary of ship status and movements. Because these notebooks are legal documents they are considered to be very accurate and are retained by each ship for a period of one year, after which time they are destroyed.

13. The primary information recorded in the OOW notebooks relates to the position and movement of the ship. These notebooks also record changes in engineering states, damage control states, and significant internal ship activities such as the movements of boats, launching and recovering of helicopters, and the conduct of major training evolutions, responses to actual events and changes in environmental conditions. They do not necessarily record other training or activities that may have taken place in the ship and only by inference would they be able to offer a record of the macro level of ship activity.

[1] The authors consider micro level activity to be anything measured in time increments of less then a day and macro level activities to have time increments of a day or more.

Ships' Logs

14. Ships' logs provide another potential source of activity information. These logs record in hand written format a watch by watch, daily written summary of a ship's activities. Past logs are considered to be legal and historical documents. They are submitted to National Defence Headquarters and are subsequently stored in the National Archives in Ottawa.

15. Since they are considered a legal document, care is taken to insure that the log entries are accurate. They are recorded in the progress of the day, thereby providing a record of the ship activities, including unplanned events. However, ship logs are text-based, making them inefficient to use for analysis purposes. As well as containing information which would be useful in tracking ship activity, ship logs also contain equal or greater amounts of data that is environmental and spatial related, or concerned with events occurring at a intra-ship level which would not be of direct concern to a macro activity-related analysis. They also have evolved into a fairly standardised format and exclude data which maybe of interest to one or more of the higher levels of command. Two examples of this are that they only record some of the many training events that the ship is involved in externally and internally, and they currently are not a very good explicit record of the day to day type of force employment or force generation activity in which the ship is involved with.

Monthly Ship Activity Reports

16. Monthly ship activity reports are reports sent ashore in message format by ships at the end of each month and are meant to serve as a record of the ship's activity for that month. Since these are pre-formatted messages that can be converted to electronic data by MCOIN II and III, they are, in theory, a potentially valuable source of ship activity information. But in practice, as is discussed in Annex A, they are not. With the advent of MCOIN II, ship activity reports began to be recorded electronically in 1990. However, while the electronic records of these reports exist for the east coast fleet from 1990 to the present day, the separation of MARCOM and MARLANT in 1993 lead to the cessation of the electronic recording of monthly activity reports from west coast units by the MARLANT-based MCOIN system that same year, (Reference [5]). The west coast data exists in the form of files of paper copies of past monthly activity reports from 1993 to the present day, (Reference [6]); however, it is not, in its present form, an easily accessible source of data for reporting or analytical purposes.

17. A ship activity report data record contains fields for an activity code and for the

recording of the start and end point of the activity. The fields for the start and end point of the activity are recorded to the minute but usually are rounded to nearest hour or half hour. These reports are derived from the OOW notebooks and the ships' logs, and as such represent a very accurate record of the duration of any given ship activity. However, there is a problem with the design and interpretation of the activity codes.

18. The codes themselves are general and open to interpretation. The assignment of the codes is done at the ship level, and a lack of diligence or ambiguity in the codes often results in different units assigning a different code for the same activity. For example, participation in an exercise could be recorded as training, as an operation, or as an allied exercise. A second problem is that over time the monthly activity reports have been largely used by the formation commands for one purpose: that being to track the time a ship spends at sea which in turn is used in the monitoring and control of fuel allocations and expenditures. Thus the information on time at sea is very accurate and valuable to the commands. However, since the information on what the ship was doing while at sea has not been put to much use by the shore staffs, the policing and use of this information and their associated codes have languished due to a perceived lack of relevance. The overall result is a potential data source which, in its current state is incomplete and inaccurate. This conclusion is borne out by a comparison of the accuracy and consistency of monthly ship activity data with the same data as contained in the Fleet Operations Schedules: a more detailed description of which is offered in Annex A.

Annual Historical Report

19. Each unit of the Canadian Forces is required to submit an annual historical report, (Reference [7]). This report is a text based narration of the major events, ceremonies and exercises in which the unit participated; of any significant changes or re-organisations which took place; and a record of the officers and service members on strength in the unit at the end of the year. Since it is a highlight of the year's activities and is prepared at the end of the year, from an analysis point of view, it is not timely, and lacks completeness, and detail. In this research note, it is mentioned for completeness, but will not be discussed further.

Post Deployment Reports

20. Post deployment reports are reports submitted by units to Fleet commanders after the completion of a major deployment. They are text based and report on the results, achievements and areas of concern that were noted in the course of a given deployment, exercise or operation.

Post deployment reports are potentially valuable subjective sources of critical assessments of the results and impact of a given macro activity. However, they are only used to report on major deployments and therefore lack completeness in terms of capturing the type of activity that a ship is involved in throughout the year. As well, like the annual historical report, post deployment reports are not timely, lack completeness and detail. For completeness they are described here but not discussed further in this report.

21. With the exception of the annual historical reports and the post deployment reports, the table on the following page, Table I, summarises the characteristics of each data source for a number of categories. The annual historical reports and post deployment reports were considered to be too general, time late, and lacking in completeness to be of value to the discussion at hand.

22. The summary provided in Table I shows that there is no one current source or combinations of sources of activity-related data and information that could be called upon to provide an easily accessible, accurate, short term and long term, comprehensive source of data to support the activity based, performance measurement tools which are being developed. The single greatest failing is that the majority of these data sources are not currently in an electronic format. Of the two that are, one, the operations schedules, have just been converted into a spreadsheet format in the past year but would still need to be translated into a database presentation. The other, the monthly activity reports, are currently converted into a database application in MCOIN II and III; however, the accuracy and completeness of the codes that are in current use in the monthly activity reports are seriously flawed, (Annex A) and the data that is currently captured in this report may only help answer some of the questions that the performance measurement tools will be asking.

Table I: Table Comparing Ship Level Activity-related Data & Information Sources

	OP SCHEDS	FLEX SCHEDS	NTBKS OOW	SHIP LOGS	MONTHLY ACT RPTS
TIME RESOLUTION					
Minute			√	√	
Hour		√			√
Day	√				
Week					
INFO ACCESSIBILITY					
Electronic	√				√
Pre Formatted Msg					√
Concise Text	√	√			
Bulky Text			√	√	
INFO RESOLUTION					
Macro	√				√
Macro with some Micro					
Micro with some Macro				√	
Micro		√	√		
INFO AVAILABILITY					
Decades	√			√	
Years					√
One Year Or Less			√		
Less Than Three Months		√			
INFO QUALITY					
Very Good			√	√	
Good	√	√			
Fair					
Poor					√

23. A more functional and useful system of activity related record system would combined the best qualities of all these attributes. In terms of Time Resolution, such a system would need to have an accuracy which ranged between 10ths of a minute to days depending on the use of the information. So that the data and information is easily stored, retrieved and transformed. Info Accessibility would need to be electronic. Again, depending on the use of the information, Info Resolution would need to range from Micro to Macro. To better serve trend analysis efforts, the Info Availability needs to be in terms of years and perhaps decades and the Info Quality would need to be Very Good. These characteristics are summarised in Table II.

Table II: Table of Combinded Activity-Related Record System Attributes

	Combined Activity-Related Record System
TIME RESOLUTION	Minutes to Days
INFO ACCESSIBILITY	Electronic
INFO RESOLUTION	Micro and Macro
INFO AVAILABILITY	Years
INFO QUALITY	Very Good

24. With an understanding of the strengths and weaknesses of the current sources of fleet based, activity-related data and information, it will be useful to consider how this fits into the navy's overall activity-related IT Architecture.

CURRENT STATE OF THE FLEETS' IT ARCHITECTURE

25. The next point that needs to be elaborated upon is what is meant by the term IT Architecture. IT Architecture defines the policies and guidelines that govern the arrangement of IT tools and data. A well thought out IT Architecture details the arrangement of IT Structures, Processes and Tools which exist in an organisation to support its information needs (Reference [8]). In turn, IT Structures refer to that aspect of the organisation which looks after funding and managing the IT capital investment and operating costs. IT Processes refers to how the processes of data storage, data transportation and data transformation are effected in the organisation. IT Tools refers to the hardware, software and data resources available to support the information needs of the organisation. Of these three components IT Structures is more of an organisational issue. As such it is not particularly germane to the topic of this paper and will not be elaborated on further.

26. If we now turn our attention to assessing the current IT Architectural support that the navy employs in the capture and use of its activity-related information, we quickly see that there are problems with its ability to support current and future needs. Using these concepts of IT Processes and IT Tools to analyse the navy's IT Architecture, the authors created the following table, Table III, which summarises the current level of IT Architectural support to activity-related information. Each entry includes a brief description of the criteria; a summarised qualitative assessment of current level of success (found under the heading of 'Status'); followed by additional amplifying remarks which support this assessment.

Table III: Table of IT Architectural Support to Activity-related Data

CRITERIA	REMARKS
IT Processes	
Data Storage: how & where is data stored, maintained and updated.	
	Status: POOR
	Most current storage formats are non-electronic text based formats. This method of storage makes it difficult to access, update and consult these sources. Two potential sources, operations schedules and monthly activity reports, exist in an electronic format but each has its own unique limitations.
	Operations schedules have recently been converted to an electronic format. Currently the two formation fleet schedulers maintain and produce the monthly fleet operations schedules in a concise and appealing graphical format using the powers of the spread sheet application of Excel. However, this type of capturing and presentation has not been built on database design principals and therefore requires that a number of as yet undeveloped steps be built to convert this data into a more accessible source of data for trend and performance measurement based analysis. As well, this information is still only a plan and not a historical record of what actually occurred. Also, it is a fairly macro presentation of the activity involved and may lack detail which would be of interest to some of the supervisory levels of command.
	Monthly activity reports also exist in electronic form and, unlike the current operations schedules, are stored in a database format, but they currently suffer from a lack of clarity, consistency of data entry, completeness, and accessibility.
Data Transport: how is data accessed and moved from source to user	
	Status: POOR
	Again the majority of data sources are paper based and are not readily available to electronic data interchange and electronic data processing concepts.
	Even those sources which are electronic are not currently readily accessible by the present day data transformer – whether that be a custom built application or a staff officer/business planner attempting to answer a business planning or perfo mance measurement related question.

Data Transformation: how, where and by whom is data transformed into information? With what applications etc.	
	Status: POOR
	This is an area that is only beginning to be probed by the navy's business planners as they try and develop meaningful and useful performance measurement tools. Past efforts such as ORES and WEAPS have relied on cumbersome manual approaches to aggregating these results. Current IT capabilities and applications promise to provide much more meaningful results to senior management if enough forethought goes into feeding the right data and information into the right measurement system.
IT Tools	
Hardware Inventory: do the current or future hardware fits support the desired data and information flows?	
	Status: FAIR
	This is a question which is largely beyond the scope of this paper; nonetheless, inquiries with DMPPD 2-8 indicate that, at least at the frigate and destroyer level, the available IT hardware suffers from a lack of physical connectivity between various systems currently in use fleetwide – systems which might reasonably be called upon to store or transform or transport activity-related info.
	Future plans would appear to eliminate many of the current physical impediments. Nonetheless, it was clear that a plan or blueprint for what could or should be done to improve the storage and transportation of activity-related data was lacking, (Reference[9]).
Software Inventory: what software applications (whether custom built or off the shelf) are available or needed to support the IT processes.	
	Status: FAIR
	The current inventory adequately supports the present limited storage and transformation of activity-related information which goes on at the various levels.
	Any sort of comprehensive attempt to apply business planning performance measurement systems (whether these be ORMS, PRAS, ORES or others) will most likely require new applications to be developed or purchased.

Data Inventory: what data? from what sources? how much and how often?	
	Status: POOR
	A current data inventory of the seven sources of activity-related info suggests that most of the data is generated for planning purposes, for historical record purposes, and for legal record purposes and only very little of it is actually used for performance measurement or levels of activity analysis.
	This is one area of data creation and record keeping that needs serious review so that the activity-related data that is needed is created, stored, accessed, and available accurately, reliably and easily. .

DISCUSSION

27. It is clear from this review of the current state of the navy's IT Architecture that it does not support the evolving field of performance measurement at the fleet and command level. Perhaps another way of looking at this issue is to point out that, having adapted business planning principles, the navy is moving away from a discrete management approach - where affairs are staffed and approved on an annual basis with a limited requirement to report what actually was done, to a much more continuous management approach - where the department and its commands are increasingly going to be asking for meaningful measurements of what is going to be done, what actually was done, and what was the difference between the two. To support such an approach, the navy needs to seriously rethink how it generates and provides the data that will be needed to answer these questions.

28. One can think of this in terms of an operations planning cycle where policy is translated into plans which in turn become activities and subsequently becomes results, the assessment of which influences both future policy and plans. A diagram of this cycle is shown in Figure I on the next page:

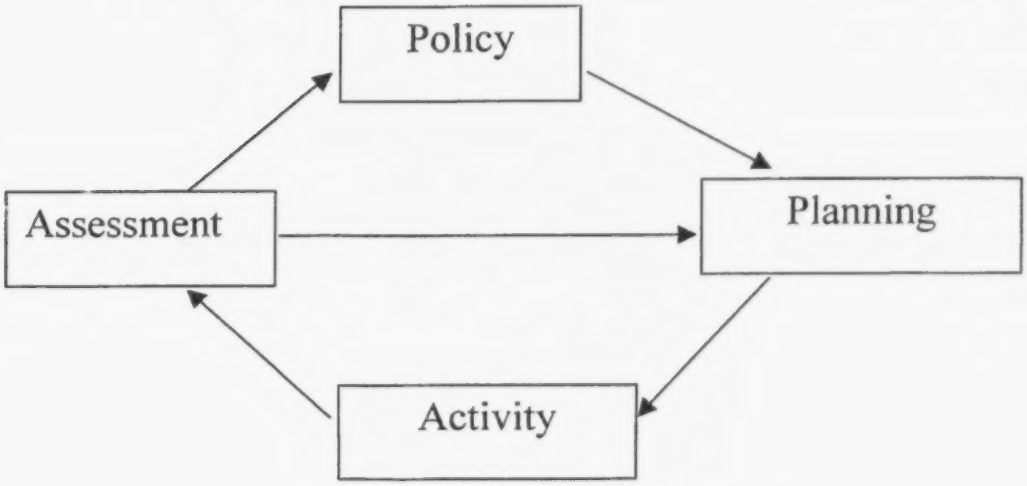

Figure I: Operations Planning Cycle

29. If one is familiar with current naval planning cycles, one can fairly easily see how this happens in a year in year out basis. One might even go so far as to say that the navy performs three of these four functions fairly well. Only recently, at the command or formation level and through the business planning approach, are they beginning to try and grapple with the fourth function, that of Assessment. However, if one thinks of this cycle in terms of how the navy's IT Architecture supports this cycle, one sees that these arrows quickly disappear and that all the connections are managed discretely and in a time honoured, manually intensive approach. One cell of naval staff drafts and interprets the departmental and environmental policy. A second cell builds and updates the operations schedule nominally in support of the policy but largely in response to any number of historical and current needs and factors. The fleet in turn executes the plan and reports in terms of how ready it is to do the nation's bidding (but not in terms of how well it followed the plan or how well it used its resources in the execution of the plan.) Finally, senior managers make discrete, subjective assessments as to how ready the fleet is to meet the policy needs of the nation. The activity-related data and information that could qualitatively and quantitatively link these four different functions exists in each function, but are currently not easily shared or readily compared.

30. It is the authors' contention that the evolution of business planning, and particularly the performance measurement aspects of business planning, will place increasing demands on units and staffs to build these links in order to provide comprehensive answers to questions such as:

a. how often did ships deploy for ship level training, to a foreign port, to defend Canada, and to support international alliances and security;

b. how often were sea training staff employed at sea;

c. how long would it take and what would the impact be of bringing an additional two ships from Normal Readiness to High Readiness;

d. if an increase in the level of Anti Air Warfare training was needed, what impact would that have on other activities and what would it cost.

Presently these questions would be answered laboriously and anecdotally by a staff check and good judgement. However, the potential exists to employ today's IT capabilities to answer these questions much more accurately, comprehensively, and efficiently. Indeed, it is the authors' opinion that it is very ill advised to proceed with the development of any sort of activity based performance measurement approach without also dealing with the issue of streamlining the storage, transportation and transformation of activity-related data and information. The alternative of tasking the ships and staffs with additional manual reporting procedures would seriously impede the acceptance and success of the overall performance measurement effort.

31. This would not be a small effort, but it most certainly is a manageable and achievable objective. In fact, in terms of providing accurate and timely data from the units that perform the activity to the authorities that manage that activity, it is the authors' view that this is an essential effort that needs to be done in consort with the development of performance measurement procedures. The obvious potential to simplify and streamline the many current, manually intensive, activity-related data collection and information creation efforts that occur at the unit and formation staff levels only serves to further justify the need for a careful rethink of the navy's activity-related, IT Architecture.

RECOMMENDATIONS

32. In broad terms what is needed is to transition the current largely paper based capture and storage of data to a well designed database management system. This should be done using a systems analysis based approach and could be accomplished in two phases:

Phase I - would begin with the conduct of an activity-related Information Audit which would benchmark the current state of the capture, storage, transportation, and transformation practices and needs of the navy's activity-related data. This effort would point out areas and processes which are redundant and could be rationalised.

Phase II - would be to proceed with the development and implementation of an activity-related, database management system which would rationalise and streamline the IT Architecture needed to support the navy's evolving activity-based, information needs. It is the authors' impression that this effort has potentially few hardware impediments (Reference [9]) and that this would entail building and implementing the required software applications and links.

SUMMARY

33. A review of the current, fleet generated, activity-related, sources of data and information finds that in their present form they are not easily accessible nor designed for use by the new activity based management approaches and performance measurement tools that are or will be evolving at the Departmental, Command and Formation levels. A comprehensive audit of the navy's activity-related, IT Architecture followed by the development and implementation of an activity-related, database management system is proposed.

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DATA CORRELATION OF OPERATIONS SCHEDULES AND ACTIVITY REPORTS

1. In the course of investigating ship activity data, two of the possible data sources were compared for correlation. In support of the CMF 2105 Study the data from past Ops Schedules have been entered into a data base and each type of macro activity has been assigned an Activity Code. As well, the monthly activity reports, which were already available in electronic format, were obtained and used in this comparison. While the category descriptions were not identical, they were close enough to draw a correspondence between the two sets. The question was how closely did the actual data from the two different sources correspond.

2. A copy of the monthly activity reports from 1 April 1990 to 1 July 1995 was used. This data consisted of four fields - ship name, activity code, start time, and end time. A sample of this data is given in Table B-I. The first column gives the ship. In this example the ship is the Algonquin. The second column is the start time of the activity, followed by the end time of the activity, then the activity code itself. Times are given in the following format: the day of the month is given by the first two digits, followed by the hours and minutes. The indication for Zulu time comes next (meaning the time is recorded in Greenwich Mean Time), followed by the month and the year.

3. The ship activity code is a four character entry. A complete list of current monthly ship activity reports is given in MARCORD 71-4 (Reference [10]). The first character identifies the primary role of the ship activity (ie: Sovereignty, Defence of North America, NATO, or Peacekeeping). The second character is a group activity code. For example, some of the groups are Training, Port Visit, Support to OGD, Trials, and Peacekeeping. The third character is either the number 1 or the number 5, to represent at sea and at shore respectively. The last character is a code to amplify the second character.

Table B-I: Sample Monthly Activity Report Data

ALG	271230ZJAN92	281245ZJAN92	1B55
ALG	281245ZJAN92	311900ZJAN92	1B15
ALG	311900ZJAN92	010000ZFEB92	1D51
ALG	010000ZFEB92	031500ZFEB92	1D51
ALG	031500ZFEB92	051300ZFEB92	1A12
ALG	051300ZFEB92	010000ZMAR92	1A52

4. This data was manipulated to produce a list of all dates and the activity code or codes with each ship for the given day. Table B-II gives a sample of the new format. Because the time fields in the monthly activity reports are entered down to the minute, for many days there is more than one entry. In these cases, two codes (or more) were entered for the ship. As an example, see 28 Jan 92 in Table B-II. This day has two entries - one corresponding to activity code 1B55, and another corresponding to activity code 1B15.

Table B-II: Sample Monthly Activity Report Data By Day

ALG	27 Jan 92	1B55
ALG	28 Jan 92	1B55
ALG	28 Jan 92	1B15
ALG	29 Jan 92	1B15
ALG	30 Jan 92	1B15
ALG	31 Jan 92	1B15
ALG	31 Jan 92	1D51
ALG	1 Feb 92	1D51
ALG	2 Feb 92	1D51
ALG	3 Feb 92	1D51
ALG	3 Feb 92	1A12
ALG	4 Feb 92	1A12
ALG	5 Feb 92	1A12
ALG	5 Feb 92	1A52
ALG	6 Feb 92	1A52

5. A similar manipulation was performed with the Operations Schedule data. The Operations Schedule is recorded initially in a descriptive format, giving a principal activity for each ship for each day. These were manually converted into a small set of activities, listed in Table B-III. A sample of the data is given in Table B-IV.

Table B-III: Operations Schedule Activity Codes

Activity	Code
Short Term Contingency	1
Scheduled NATO/UN Ops	2
Scheduled OGD	3
International Exercise	40
National Exercise	41
Training – WUPS	42
Training - Transit or ISE	43
Training - OROs, DNO, etc	44
Trials	45
In Home Port	46
In Foreign Port	47
Leave	48
Maintenance	49
Major Refit	50
Home Port - Not Available	51

Table B-IV: Sample Operations Schedule Data

Ship	Activity	Start Date	Duration
ALG	trump	1 Apr 90	365
ATH	h	1 Apr 90	1
ATH	awups	2 Apr 90	9

6. The activity was manually codified and converted into a daily format, as shown in Table B-V. In the sample provided, information for two ships is given. The first ship, Algonquin, is given the descriptive activity *trump* for the entire time of the sample. This is

equivalent to activity code 50. As can be seen in Table B-V, this ship was entered once per day with this activity code. The second ship, Athabaskan, was given the activity *h* for the first day (corresponding to activity code 46), and the activity *awups* for the next nine days (corresponding to activity code 42). An entry for each day is made in Table B-V for this ship.

Table B-V: Sample Daily Operations Schedule Data

Ship	Day	Activity
ALG	1 Apr 90	50
ATH	1 Apr 90	46
ALG	2 Apr 90	50
ATH	2 Apr 90	42
ALG	3 Apr 90	50
ATH	3 Apr 90	42
ALG	4 Apr 90	50
ATH	4 Apr 90	42

7. Once the two daily activity tables were build, they were combined into a single table which gives the ship, the day, the monthly activity reports code, and the Operations Schedule activity code. Once again, this combination produces days that have more than one combination of codes, since the monthly activity reports table has some days with more than one code. This format now allows for comparisons of the number of days for which a given pair of activity codes have been entered.

DATA ANALYSIS

8. In total, there are 54,032 entries in the monthly activity reports table and 68,226 entries in the Operations Schedule table. When combined into a single table, there are

44,780 entries. There are a number of reasons for the discrepancy in the number of entries. There are days for which the Operations Schedule table has entries, but there is no corresponding entry in the monthly activity reports table and vice a versa. These discrepancies are mostly due to two reasons. First, vessels in port are recorded in the Operations Schedule, but are not entered in the monthly activity reports table. Secondly, monthly activity reports entries are made for ships that are undergoing final trials before acceptance into the Canadian Navy, but this period of activity is generally not recorded in the corresponding Operations Schedule. There are also large gaps of missing data where ship activity is available in the Operations Schedule table, but not in the monthly activity reports table. These are mostly due to the fact that after 1 Jul 93, changes to the Naval command structure resulted in monthly activity reports entries for ships based on the west coast not being entered into the database. Despite the gaps of data in one or another of the data sets, the combined table still has almost 45,000 records that can be analysed.

9. As an illustration of some of the problems with the monthly activity reports data, consider the amount of fleet time devoted to conducting short-term contingency operations. In the Operations Schedule data, this is recorded fairly reliably, and was given the Operations Schedule activity code 1. A high correspondence would be expected with the ship activity reports beginning with 1C (nationally sponsored exercise/deployment). However, as Figure B-I shows, many other monthly activity reports codes are entered to correspond to Operations Schedule code 1.

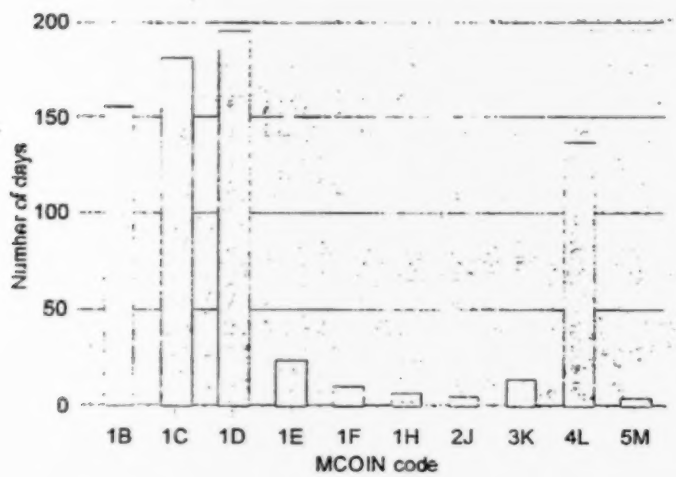

Figure B-I: Monthly Activity Reports Code Distribution for Operations Schedule Code 1

10. There are a total of 730 entries that have Ops Operations Schedule activity code 1. As can be seen in Figure B-I, a large number of the corresponding monthly activity report entries are 1C (nationally sponsored exercise/deployment)as expected. Also, entries in 1D denote a port visit, and are credited to the last non-visit activity, so a large number of these entries are also expected. However, there are also a large number of entries corresponding to categories 1B (training) and 4L (peacekeeping).

11. A closer study of the Operations Schedule activity code 1 is more revealing of the difficulties with monthly activity reports. As has been noted there is a large component of monthly activity reports code 4L (peacekeeping) corresponding to Operations Schedule code 1. When these entries were examined, it was discovered that they were all entered by one ship, HMCS Fraser, during Op Friction in 1990-91. The other ships on this deployment, HMCS Athabaskan, Terra Nova, and Protector, were conducting similar duties, but had entered other monthly activity report codes, mostly 1C (nationally sponsored exercise/deployment). This is an instance of four ships being on the same deployment and conducting very similar tasks, but entering different monthly activity report codes.

12. Although the previous example only looks at one instance of correlation, similar circumstances exist with many other codes. A look at the monthly activity report codes and associated definitions reveal a number of problems with the codes as they exist. These problems are outlined in the following sections.

REDUNDANCY

13. The codes as structured have a large degree of redundancy built into the definitions. The most glaring example of this lies with the first character. It is possible to deduce this character using only the second character. Thus, this character adds no valid information the activity codes; ie: no information would be lost if this character were not present.

14. Another, less obvious, area of redundancy lies in the codes for port visits. The activity code category 1D represents port visits, either Canadian or Foreign. This information is already coded to a great extent in the third character. Also, since the third character is limited to being either a 1 or a 5, extra characters could be introduced into this

position to cover time spent in port that should be captured. Thus, the entire 1D section of MCOIN codes is either redundant, or could easily be made redundant.

INCONSISTENT ENTRIES

15. Many of the monthly activity report codes do not make it clear which should be entered in a particular situation. Usually this is due to two or more codes being appropriate. An example was given earlier where four ships were conducting similar tasks during Op Friction. Three ships entered a code for a nationally sponsored deployment, but one ship entered the code for peacekeeping. Both codes are representative of the particular action that was being undertaken. However, it is difficult to conduct any analysis if the codes are being entered inconsistently. This particular inconsistency makes it impossible to deduce the time spent of national deployments through the use of monthly activity report codes.

16. A look at the codes entered for the various ships reveal a number of occasions when this problem was encountered. For example, a NATO exercise can be entered as training (1B), nationally sponsored exercise (1C), or NATO (3K). A peacekeeping mission could be entered as a nationally sponsored deployment (1C), NATO (3K), or peacekeeping (4L). All of the codes could be interpreted as applicable to the mission, but these inconsistencies prevent an analysis of ship activities through monthly activity report codes.

SECONDARY MISSIONS

17. In many cases, a ship will be performing more than one mission at a time. For example, a ship may be conducting surveillance duties while taking the opportunity to provide refresher training to a large segment of the crew. Currently, the monthly activity report codes do not allow for a description of this situation. A choice has to be made, although each activity is equally relevant to the ship's activity.

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This research note presents a review of the current sources of unit level, activity-related, data and information followed by an assessment of the Information Technology Architecture which is currently in place in the Canadian Forces' Maritime Command to support the capturing, transportation and transformation of activity-related data and information. It finds that this Information Technology Architecture is unsuited for the Department of National Defence's projected, activity-based, performance measurement needs. To improve this situation this research note recommends that a systems analysis based Information Audit be conducted followed by the development and implementation of an activity-related database management system.

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